



Determination of Ascorbic Acid Concentration of Some Commercial Fruits Juices Sold in Ugbokolo Benue State, Nigeria

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ABSTRACT

This research was aimed at investigating the concentration of Ascorbic Acid (Vitamin C) in some commercial fruits juices: '5' Alive, Hollandia yoghurt, Nutri milk, Ribena, Lacasera, Happy hour, Viju milk, Chi exotic and Chi vita sold in Ugbokolo, Benue State, Nigeria by titrimetric method using 2,6-dichlorophenolindophenol (DCPIP) as titrant. The ascorbic acid (AA) content in milligram per 100ml of the various juices investigated is in the order: '5' Alive (11.25) > Ribena (5.47) > nutri milk (5.31) > Happy hour (4.38) > Hollandia yoghurt (1.25) > Lacasera (0.47) ≈ Chi exotic (0.47) > Viju milk (0.31) > Chi vita (0.16). It was observed that half a litre of '5' Alive (56.25 mg AA) a day is suitable for adults and pregnant women, a litre each of Ribena (54.70 mg AA) and Nutri milk (53.10 mg AA) per day for adults, while a litre of Happy hour (43.80 mg AA) per day is suitable for adolescents. It can be concluded that commercial fruits juices when taken in large amount will add to the daily human dietary intake of the vitamin.

Keywords: Ascorbic Acid, Fruits Juice, DCPIP, Titrimetric Method

1 Introduction

Human health is very important to our survival. Vitamins assist the human to maintain a healthy diet. They form essential components of the specific co-enzymes which help in metabolism and other specialized activities [1]. There is very little in our bodies that can be done without a vitamin being needed and as such it is important to know the types, fat soluble and water soluble before learning about each one [2]. Fat soluble vitamins are those stored in fat cells when excessive in our body. They have an associated level of toxicity as they are not easily gotten rid of by the body. Fat usually require fat to be

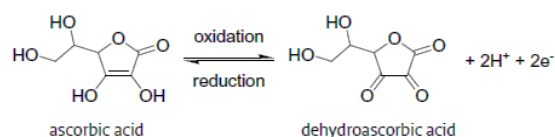
absorbed. Fat soluble vitamins include vitamins A, D, K, E etc [2]. Water soluble vitamins are not stored in the body. The body extracts what it needs and the remaining removed as waste. These vitamins are also easily destroyed by cooking. Water soluble vitamins include thiamin, riboflavin, niacin, B₆, B₁₂, biotin, folic acid, pantothenic acid, ascorbic acid etc [2]. For the sake of this paper, only ascorbic acid (vitamin C) was treated further.

Chemically, ascorbic acid is a six-carbon sugar, with a diol grouping at carbons 2 and 3 which is readily oxidized to a diketo group to form dehydroascorbic acid (DHAA) [3]. Its ready oxidation to DHAA being the most prominent chemical property of the vitamin is presented in equation 1 [4].

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(1)

Ascorbate is best recognised for its role as an anti-oxidant and of its function in collagen synthesis. Symptoms of scurvy result when collagen is deficient. Scurvy is a form of avitaminosis characterised by loose teeth, superficial bleeding, fragility of blood vessels, poor healing, compromised immunity, mild anaemia [5, 6]. According to [5], vitamin C is also required for synthesis of dopamine, noradrenaline and adrenaline in the nervous system or in the adrenal glands.

It is to be noted that the requirement of vitamin C increases during pregnancy, lactation, adolescence, hyperthyroidism, infection and after surgery [7]. Maintenance of daily dietary intake of vitamin C leads to the prevention of scurvy. Ascorbic acid has found usefulness in the treatment of cold and flu [8], protect against cancers, heart disease and stress [4], helps in maintaining a healthy immune system, aids in neutralizing pollutants and needed for antibody production [5].

The dietary amounts recommended by various authorities are 50-150mg of ascorbic acid per day. Some recommended nutrient intakes for vitamin C as reported by [9] is presented in Table 1.

Table 1: Recommended Nutrient Intakes (RNIs) for vitamin C, by group

Group	RNI (mg/day)
Infants and Children	
0 – 6 months	25
7 – 12 months	30
1 – 3 years	30
4 – 6 years	30
7 – 9 years	35
Adolescents	
10 – 18 years	40
Adults	
19 – 65 years	45
65 + years	45
Pregnant women	55
Lactating women	70

More than 90% of vitamin C in human diet is gotten from fruits and vegetables [7]. Citrus fruits and juices are particularly rich sources of vitamin C but other fruits including cantaloupe and honey dew melons, cherries, kiwi fruits, mangoes, papaya, strawberries, tangelo, tomatoes and water melon also contain variable amounts of vitamin C [10].

In Nigeria today, there are few or no researches carried out to quantify the vitamin C contents of most commercial fruits juices in which many are new products available in the market. Hence this research was conducted to determine the concentration of vitamin C in some commercial fruits juices: '5' Alive, Hollandia yoghurt, Nutri milk, Ribena, Lacasera, Happy hour, Viju milk, Chi exotic and Chi vita in order to ascertain their quantity required for recommended daily nutrient intake of the vitamin.

2 Study Area

Ugbokolo Community is located in Okpokwu Local Government Area in the southern part of Benue State, Nigeria. It lies approximately between latitudes 7°08'00"N and 7°13'48"N and longitudes 7°41'42"E and 7°49'30"E. The area is bounded in the north by Ohimini Local Government Area, in the northwest by Kogi State, southwest by Ogbadibo Local Government Area, southeast by Okonobo Ward, and east by Amejo Ward in Edumoga, Benue State, Nigeria [11]

3 Materials and Methods

3.1 Samples Collection and Preparations

Some commercial fruits juices namely; '5' Alive, Hollandia yoghurt, Nutri milk, Ribena, Lacasera, Happy hour, Viju milk, Chi-exotic and Chivita samples used in this study were purchased from Ugbokolo main market. These samples were thoroughly screened for expiry. The fruits juice samples were then prepared for the determination of Vitamin C. For the analysis of vitamin C in the samples, determination was done on the same day of uncovering to avoid lost of ascorbic acid due to air oxidation [4].

3.2 The Dye Titration Method

Standardization of the titrant 2, 6-dichlorophenolindophenol (DCPIP) was first carried out by titration with standard ascorbic acid solution. 5 ml each of the juice samples except for Ribena (10 ml) were taken with a standard micro pipette into a 100 ml conical flask. This served as vitamin C extract [7]. The burette was filled with 0.1% dichlorophenolindophenol (DCPIP) and adjusted to zero mark. The dye was then added drop wise into the 5 ml juice sample, after which the blue colour quickly disappeared. Continuous addition was then conducted carefully until the blue colour remained permanently and volume of DCPIP used was noted. The procedure was repeated for second and third titrations noting the volume of DCPIP used each time [4].

4 Results and Discussion

The contents of L-ascorbic acid in the different commercial fruits juices were determined by titrimetric method and the results presented in Table 2 and Figure 1.

Table 2: Ascorbic Acid (AA) contents (mg/100 ml sample) of some commercial fruits juices and volume of DCPIP used (ml)

Fruits Juice	DCPIP used (ml)	AA (mg/100ml)
'5' Alive	3.60	11.25
Hollandia Yoghurt	0.40	1.25
Nutri-milk	1.70	5.31
Ribena	3.50	5.47
Lacaseria	0.15	0.47
Happy Hour	1.40	4.38
Viju-milk	0.10	0.31
Chi-Exotic	0.15	0.47
Chivita	0.05	0.16

It has been established from the standardization of DCPIP by standard ascorbic acid that 1 ml DCPIP is equivalent to 1.5625×10^{-4} g ascorbic acid.

From Table 2, the average volume of DCPIP used for titration with 5 ml '5' Alive was 3.60 ml, which is equivalent to 5.625×10^{-4} g ascorbic acid. That is, 5 ml samples contained 5.625×10^{-4} g

ascorbic acid. Thus 100 ml samples contained 11.25 mg ascorbic acid. Similar calculation was done for the remaining juice samples and results shown in Table 2 and Figure 1.

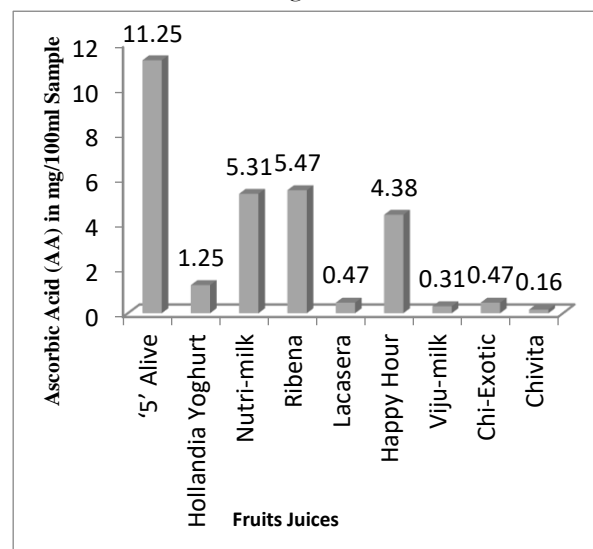


Figure 1: Ascorbic Acid (AA) Concentration (mg/100ml) sample of some commercial fruits juices

From the results of experimental analysis presented in Table 2 and Figure 1, the amount of ascorbic acid in mg per 100 ml sample of the various commercial fruits juices is in the order: '5' Alive (11.25) > Ribena (5.47) > Nutri milk (5.31) > Happy hour (4.38) > Hollandia yoghurt (1.25) > Lacaseria (0.47) \approx Chi-exotic (0.47) > Viju milk (0.31) > Chivita (0.16). '5' Alive relatively contained the highest amount of vitamin C while chivita has the lowest. The vitamin C contents of '5' Alive, Ribena, Nutri-milk and Happy hour are relatively appreciable. The relatively higher vitamin C content of '5' Alive (citrus burst) may be attributed to the presence of the citrus species (orange, lemon, grapefruit, tangerine and lime) as essential components of the juice [4, 12]. It can therefore be said that 500 ml (half a litre) of '5' Alive gives 56.25 mg ascorbic acid which is in the range of daily recommended nutrient intakes for adults and pregnant women (Table 1). For Ribena, Nutri milk and Happy hour, 1000 ml (1 litre) gives 54.7 mg, 53.1 mg and 43.8 mg ascorbic acid respectively. A litre daily intake of Ribena and Nutri milk would be better for adults while a litre per day of happy hour would be good for adolescents (Table 1).

5 Conclusion

Analysis showed that in terms of vitamin C, '5' Alive was best among the tested samples of commercial fruit juices. Citrus species are rich sources of vitamin C as seen from higher vitamin C content of '5' Alive. Since these commercial fruits juices are always available in local markets and stores, and they are also not too expensive, the considerable amount of vitamin C presents in these juices showed that when they are consumed in relative large amount, they will certainly contribute to the daily human dietary intake of the vitamin.

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